Identification

Overview of Traffic Controller Data Bases
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Purpose

Associated with the Traffic Controller are certain data
bases, some of which are per-system and other of which
are per-process. (Per processor data bases are discussed
in sections BK.) The details of these various data bases
are discussed in the remaining sections of BJ.1. The
present section is an overview and a discussion of the
strategies used for selecting a particular data base for
a particular item.

Per System Data Bases

All per-system data bases are maintained by the Traffic
Controller in segment <tc_data>. There are five major
parts of this segment:

1.   The Traffic Controller Data Block (TCDB)

2.   The Active Process Table (APT)

3.   The Process Wait Table(PWT)

4.   The APT Hash Table (APTHSH)

5.   The Device Signal Table (DST)

The Traffic Controller Data Block is a collection of
miscellaneous items in segment tc_data; some of these
items are internal to the Traffic Controller (pointers
to the various tables, table descriptions), others (such
as the variable containing the number of loaded processes)
are of general interest.

There are two main categories of items in this data block:
Certain per-system Traffic Controller items have to go
somewhere and seem most naturally to go here. There are
also system parameters which presumably will not be changed
other than occasionally by a system administrator (for
example, the number of levels in the multi-level ready-list).
Rather than have these parameters built into code as constants,
it seems more appropriate to collect them all in a single
place. The TCDB is described in BJ.1.01.

The Active Process Table contains certain information
about each process which is currently active. An item
must go into the APT if it needs to be accessed from other
processes. For example, sending a wakeup to a process
involves knowing that process' execution-state; likewise,
selecting the next process to run from the top of the
ready-list involves knowing that process' eligibility.
Consequently, those pieces of information have to be kept
in the process' APT entry. The APT is discussed in BJ.1.02.

All processes waiting for a particular system event are
threaded into a single list (associated with this event)
and the head of the thread is kept in the Process Wait
Table. The PWT is a table containing a group of pointers
to a collection of event threads running through the APT.
The PWT is described in BJ.1.03.

Communication between processes is done on the basis of
(symbolic) process identification, but the communication
itself requires knowing the location of the target-process'
APT entry. To make looking up the APT given a process-id
efficient, a hash-table of process-ids is maintained by
the Traffic Controller; APTHSH is a typical hash table
associating process-ids and relative pointers into the
APT. The APTHSH is described in BJ.1.04.

The Device Signal Table is a table similar to the APT hash
table which gives a device_number/APT-entry correspondence
and thus provides an interface between I/O interrupts
and the Traffic Controller's entry point `Wakeup'. The
Device signal table is described in BJ.1.05.

All of these data bases are accessed in the hardcore ring
at times when page faults cannot be tolerated, so segment
<tc_data> (as well as the procedures constituting the
Traffic Controller) is wired down. It is accessible for
reading and writing in the hardcore ring only.

Segment <tc_data> is pre-assembled, and loaded during
system initialization time from the Multics System Tape (MST).
It is initialized by a procedure named tc_data_init which
allocates space in <tc_data> for the various above-mentioned
tables, initializes the tables and puts values into the
variables in TCDB. By convention, mainly for reasons
of clarity, all tables begin at an address that is 0 mod 64,
and all APT entries begin at an address that is 0 mod 16.

Per Process Data Bases

In addition to the per-system data bases described above,
the Traffic Controller maintains certain data bases for
each process in the system. In general, there are two
types of data: that which must be wired down, and that
which need not be. The former is kept in the Process
Data Segment (PDS) and the latter in the Process Definition
Segment (PDF).

The process data segment contains two basic items: The
process' concealed stack and a block of miscellaneous
data referred to as the Process Data Block (PDB). The
PDS is discussed in BJ.1.06.

The process definition segment is similar to the process
data segment but it is not wired down. It also contains
two items: The fault stack and the Process Definition
Block. The PDF is discussed in BJ.1.07.

Strategies

All Traffic Controller data items of a per-system nature
are kept in segment tc_data. Per-process items can be
kept in either the APT, the PDS or the PDF. If the item
must be accessed by any other process it is kept in the
APT. Otherwise, the decision as to which block to put
it in is based on whether or not it must be wired-down:
If so, it must go into the process data block; while if
not, it may go into the process definition block. Clearly,
it is desirable to put as few items as possible into the
process data block so as to minimize the amount of wired-down
core.

For convenience, certain items are kept in both the APT and
the PDS. These are items which other processes need to
know, but which the current process must access frequently.
Accessing the PDS is more efficient.